

THE LIFE HISTORY OF THE HAWK MOTH *LANGIA TROPICUS* MOULDS (LEPIDOPTERA: SPHINGIDAE) TOGETHER WITH NEW DISTRIBUTION RECORDS FOR THE SPECIES

D.A. LANE¹ and M.S. MOULDS²

¹3 Janda Street, Atherton, Qld 4883 (Email: d.l.lane@bigpond.net.au)

²6 Victor Place, Kuranda, Qld 4881 (Email: msmoulds@bigpond.net.au)

Abstract

The early stages of the hawk moth *Langia tropicus* Moulds are described from northern Queensland and aspects of the species' biology are discussed. All known larval food plants are members of the coarse-leaved Flame Trees that occur throughout the dry monsoonal tropics of northern Australia, namely *Brachychiton chillagoensis* Guymmer, *B. albidus* Guymmer and *B. paradoxus* Schott & Endl. (Sterculiaceae). New distribution records from Western Australia and northern Queensland are included.

Introduction

Langia tropicus Moulds, 1983 has been recorded from a wide area across northern Australia, from Kununurra in northeastern Western Australia, across the northern third of the Northern Territory, and in northern Queensland from near Georgetown, Chillagoe and the Coen district (Moulds 1983). From a period commencing in the early 1990s, larvae of *Langia tropicus* have been collected regularly by one of us (DAL) from the Chillagoe district, where they were found feeding on the coarse-leaved Flame Tree *Brachychiton chillagoensis* Guymmer and reared through to adults. Subsequently, larvae were also found feeding on the closely allied *Brachychiton albidus* Guymmer at the Newcastle Range, 60 km east of Georgetown, from near Mt Surprise, and from Undara National Park, south-west of Mount Garnet, and on *Brachychiton paradoxus* Schott & Endl. from near Coen, also in northern Queensland. However, it was only recently that we were able to observe and photograph all larval instars, again from the Chillagoe district, allowing the complete life history to be documented.

New distribution records

WESTERN AUSTRALIA: 1 ♂, Great Western Hwy, 100 km SE of Derby, 31.xii.1985, M.S. & B.J. Moulds; 1 ♀, Wyndham, 5.i.1966, M.S. & B.J. Moulds. QUEENSLAND: 1 ♀, York Downs, 50 km E of Weipa, 28.xii.1983, M.S. & B.J. Moulds; 3 ♂♂, 2 ♀♀, Archer River xing, 60 km N of Coen, 29.xii.1983 and 9.i.1988, M.S. & B.J. Moulds; 1 ♀, 50 km S of 40 Mile Scrub, 29.xii.2007, Dennis Kitchin; 1 ♂, 4 km N of Mt Surprise, bred/larva, 15.ii.2005, D.A. Lane; 2 final instar larvae observed (both parasitised by tachinid flies), Undara National Park, 12.ix.1999, D.A. Lane.

The above records extend the previously recorded distribution from the eastern Kimberley to the western Kimberley in Western Australia and in Queensland north from Coen to the Archer River and York Downs (some 50 km E of Weipa) on Cape York Peninsula and south-east to the Mt Surprise district (Mt Surprise, Undara and 50 km south of 40 Mile Scrub).

Food plants and habitat

All known larval food plants are members of the coarse-leaved Flame Trees (Sterculiaceae) that occur throughout the dry monsoonal tropics of northern Australia, namely *Brachychiton chillagoensis*, *B. albidus* and *B. paradoxus*.

In the Chillagoe district, *Langia tropicus* favours the extensive limestone outcrop areas where its food plant *B. chillagoensis* grows as a small to medium-sized tree in and on the verges of vine scrub thicket areas that predominately straddle the limestone outcrops. These trees defoliate during the dry season, but following the first wet season storms they respond with a fairly rapid flush of fresh leaf growth.

In the Newcastle Range area, approximately 55-60 km east of Georgetown, and at Mt Surprise, the habitat is more open compared with that of the Chillagoe district, but contains an equally widespread occurrence of coarse-leaved *Brachychiton* food plants, often growing in steep and rocky gullies or escarpment areas where fires rarely reach, allowing the plants to maintain a stronghold. In the Undara district the food plants predominately grow along the collapsed lava tubes in vine scrub habitat.

The group of coarse-leaved Flame Trees includes many other species found across the range of *L. tropicus* and it is likely that several of these also will be found to be host plants. Such species include *B. vitifolius* (Bailey) Guymer and *B. muellerianus* Guymer from the Laura and Coen districts respectively in northern Queensland, *B. megaphyllus* Guymer from the Northern Territory, and *B. incanus* R.Br. and *B. fitzgeraldianus* Guymer, both from the Wyndham and Kununurra districts of northern Western Australia.

Description of early stages

Egg (Fig. 1). Pale yellow in colour, smooth and glossy to the naked eye; subspherical, being slightly elongate and slightly flattened top and bottom; approximately 1.9 mm long, 1.7 mm wide and 1.5 mm high.

First instar larva (Fig. 2). Pale green with pale dull yellow head. Meso- and metathoracic segments wrinkled with transverse rings of folded flesh of similar size, the meso- and metathorax each comprising six such folds, abdominal segment 1 seven folds and abdominal segments 2-7 each with eight; each fold with many small protuberances arranged along its width and each terminating with a minute, fine seta microscopically bifurcate at apex; a row of tubercles along the length of larva either side of dorsal surface largest; these tubercles each carrying a primary seta and arranged as a fused pair mid length on meso- and metathorax, two each evenly spaced on abdominal segments 2-7. Prothoracic shield pale green, indistinct, with 10 primary tubercles spaced more or less evenly around perimeter, each terminating in a fine seta microscopically bifurcate at apex. Head rounded, with many small white tubercles barely discernable; vertex smooth and rounded; ocelli black; antennae muddy pale yellow; mouthparts muddy pale yellow with apices of

mandibles black. Thoracic legs, prolegs and anal prolegs (claspers) pale green. Claspers and anal plate with scattered small tubercles as on body, a submedian pair of these on anal plate much larger than any other, elongate, formed from a fusion of three tubercles, each with a long seta. Spiracles pale green, similarly coloured to thorax and abdomen.

Caudal horn dull pale yellow; slender, approximately 1.5-1.6 mm long; barely curved forwards or straight; throughout its length densely covered in numerous microscopic spine-like tubercles that are similarly coloured to shaft of horn; apex of horn minutely bifurcate, the branches sometimes tending brown, wide apart, very short, conical, aligned in the transverse plane and terminating in a fine almost colourless seta; a few (about 3-5) tubercles that are a little smaller than terminal bifurcation on distal quarter or so of shaft.

Length on hatching approximately 6 mm; length at maturity approximately 9 mm. Width of head capsule approximately 1.2 mm. Duration approximately 3-4 days.

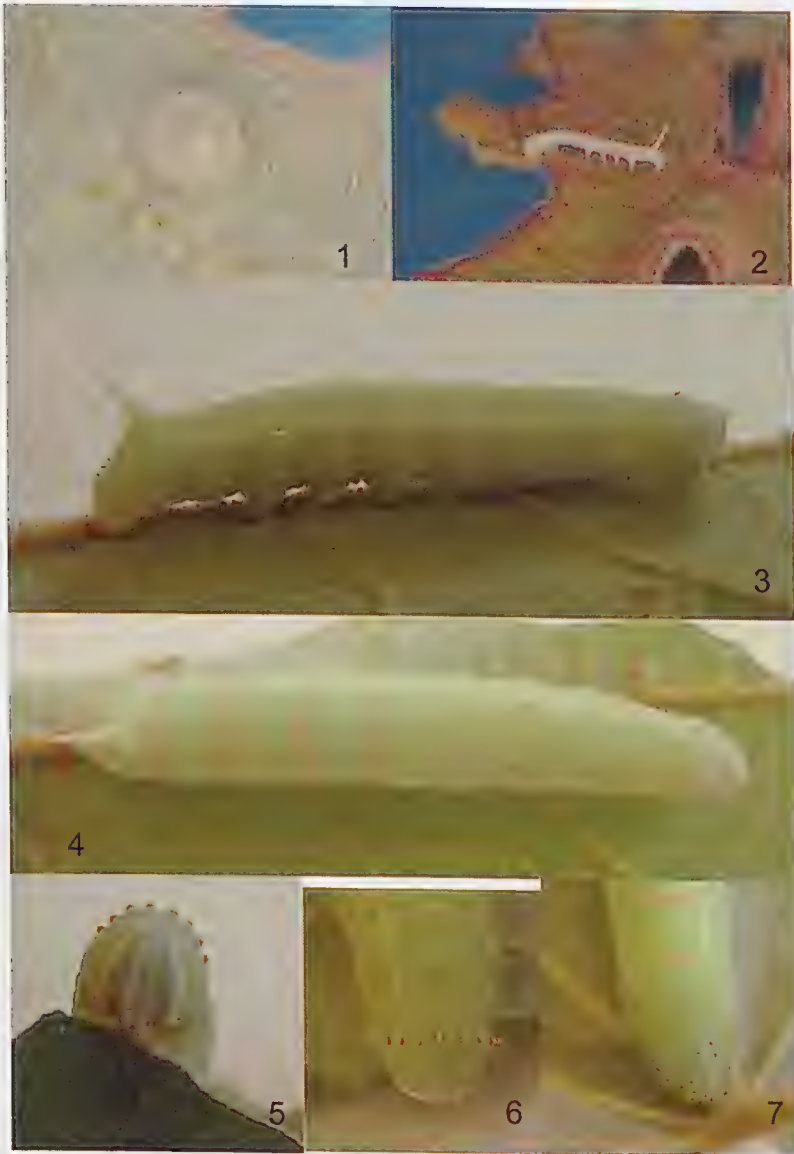
Second instar larva. Pale green with pale muddy green head. Thoracic and abdominal segments folded into multiple transverse fleshy rows with small protuberances, setae as in first instar. Head with many small, pointed, white tubercles (similar to those on body) scattered over surface; vertex bearing a pair of pale yellow conical tubercles either side of coronal suture, larger than any other tubercles on head; ocelli black, antennae muddy pale green; mouthparts muddy pale green with apices of mandibles jet black. Prothoracic shield similar to that of first instar. Thoracic legs, prolegs and anal claspers pale muddy green. Anal plate with scattered small white tubercles as on body, a pair of these at base either side of midline much larger than any other. Spiracles pale green, similarly coloured to thorax and abdomen.

Caudal horn pale brown; approximately 2.4 mm long; bearing many very small sharply-pointed tubercles mostly similarly coloured to shaft but a few black or nearly so; apically bifurcate, the branches much longer than any tubercle, directed outwards at 45° or slightly less.

Length at maturity at rest approximately 12 mm. Width of head capsule approximately 1.8 mm. Duration approximately 4 days.

Third instar larva. Similar to second instar. Vertex of head bearing a pair of bright orange conical tubercles clearly larger than all others on the head, one either side of coronal suture, these directed straight up and parallel to each other and each terminating in a microscopic seta.

Caudal horn very pale brown; 3.5 mm long; shaft bearing many short, sharply pointed, conical tubercles of slightly different lengths, most very pale brown but some black; apically bifurcate, the branches no longer than the largest tubercles on shaft, black on their apical half or so, otherwise brown to very pale brown.



Figs 1-7. Early stages of *Langia tropicus*. (1) egg; (2) first instar larva; (3-4) fourth instar larva: (3) lateral view; (4) dorsal view; (5-7) fifth instar larva: (5) head frontal view; (6) head and prothoracic shield dorsal view; (7) eighth abdominal segment, anal plate and caudal horn, oblique view



10



9

11

Figs 8-11. Early stages of *Langia tropicus* (continued). (8-10) fifth instar larva: (8) lateral view; (9) dorsal view; (10) close up of head and thoracic segments, showing strategically placed tachinid fly eggs; (11) pupa: lateral, dorsal and ventral views.

Length at maturity at rest approximately 20 mm. Width of head capsule 2.6 mm. Duration approximately 5 days.

Fourth instar larva (Figs 3-4). Pale green with head a slightly darker green. Thoracic and abdominal segments folded into multiple transverse fleshy rows, each with many small protuberances along its length, these tubercles dull white in colour, all of similar size, conical, and all terminating in a minute simple seta. Prothoracic shield pale bluish green, not sclerotized, bearing eight prominent, bright pink, short, conical tubercles of similar size, each capped white, and more or less evenly spaced across the width of the shield. Head with many small white tubercles (similar to those on body) scattered over surface; vertex of head bearing a pair of conical tubercles, pale pink but tending white apically, clearly larger than any other on the head; ocelli inconspicuous, black or brown; antennae pale green; mouthparts pale green with apices of mandibles jet black. Thoracic legs, prolegs and anal prolegs (claspers) pale muddy green. Anal plate muddy pale green, with pink conical tubercles similar to those on prothoracic shield but not quite as large and not quite as brightly coloured, these more or less evenly spaced mostly around perimeter but 3 interior. Spiracles turquoise, those on abdominal segments a little darker.

Caudal horn pale pink; straight, long (approximately 7.5 mm), slender and gradually tapering to a point; shaft bearing many short, sharply pointed, conical tubercles of slightly different lengths, most similarly coloured to shaft, pale pink but a few black; apically bifurcate, the branches a little longer than the largest tubercles on shaft, pale pink, V-shaped.

Length at maturity at rest approximately 35-45 mm. Width of head capsule 4.9 mm. Duration approximately 6 days.

Fifth instar larva (Figs 5-10). Head, thorax and abdomen pale green over a little more than dorsal half, ventral remainder pale greyish green; non glossy; mesothorax, metathorax and abdominal segments 1-7 divided into transverse fleshy rings. Mesothorax, metathorax and abdomen bearing a pale yellow subdorsal stripe from about anterior of mesothorax to anterior of abdominal segment 8 at which point it abruptly terminates; sometimes a spot of similar colour on abdominal segment 8 near distal end of pale yellow abdominal stripe; yellow pigmentation also narrowly encircling abdominal spiracles somewhat irregular in outline; the distal fleshy fold of mesothorax, metathorax and abdominal segments 1-7 dull pink, most obvious on abdominal segments. Head in frontal view rounded, slightly broader towards base, apical protuberances present in earlier instars absent, pale green with a broad white stripe down the length of each cheek continuing to antennae; median region with a narrower white stripe of slightly less intensity either side of coronal suture and along frontal sutures, frontoclypeal triangle white or greenish white; ocelli mostly translucent white or pale green but usually three distinctly brown; antennae whitish; mouthparts tending white with

apices of mandibles jet black. Prothoracic shield pale bluish green, not markedly sclerotized, bearing eight prominent (collar like), bright pink, short, conical tubercles of similar size, each capped white, and more or less evenly spaced across the width of the shield along its posterior margin; anterior margin with very small white tubercles and some even smaller tubercles scattered elsewhere. Anal plate light bluish green with bright pink conical tubercles similar to those on prothoracic shield, these more or less evenly spaced, most around perimeter but three interior. Prothoracic spiracles turquoise, abdominal spiracles deep bluish green, all with a narrow black vertical midline reaching almost full length. Thoracic legs and ventral prolegs entirely pale greyish green; anal prolegs (claspers) light bluish green with bright pink conical tubercles scattered over surface similar to those on anal plate; crotchets brown.

Caudal horn straight, conical, very short, approximately 1.5-1.7 mm long; salmon pink in colour, tending glossy; surface smooth, lacking noticeable tubercles and setae even at magnification (x50) except at apex; apex smooth and rounded with two very fine short setae spaced apart and angled at about 30° to midline.

Length of mature larva at rest approximately 65 mm (male), 75 mm (female). Width of head capsule approximately 6.5 mm (male), 7.5 mm (female). Duration approximately 8-9 days.

Pupa (Fig. 11). Length 42-50 mm. Dark brown, smooth and glossy; head bluntly rounded and lacking protruding features; abdominal segment 1 totally lacking pits; abdominal segments 2-8 each with a single row of deep pits near anterior margin; abdominal segments 8-10 with many very small pits scattered across surface, most dense on segment 10. Cremaster black; glossy; gnarled; terminating in a linear projection about 0.5 mm long, the apex of which carries a small cluster of gnarled rounded protuberances.

Biology

At Chillagoe, the first adults of *Langia tropicus* emerge following the flush of fresh growth induced by the onset of wet season rains, usually in mid to late December. Adults are nocturnal and remain active throughout the wet season, usually until late March.

Eggs are deposited singly, usually on the underside and rarely on the upside, of fresh but well developed leaves usually a short distance from the leaf margin. Oviposition occurs only on coarse-leaved *Brachychiton* species, never on the smooth-leaved *Brachychiton diversifolius* R.Br., which also grows in the Chillagoe limestone outcrops along with the host tree *B. chillagoensis*. Extensive searching of *B. diversifolius* has never revealed signs of *Langia tropicus* larvae, or any sign of eggs.

During all instars, larvae rest and feed on the underside of leaves, usually resting along the midrib vein. In this position they are remarkably well

camouflaged, with their colouration closely matching and blending with the pale colouration of the underside leaf pattern.

Larval parasitism by tachinid flies was observed. The flies oviposited on late or final instar larvae, their eggs being placed on the head or thoracic segments so that the larvae could not reach them with their mouthparts. In some other species of Sphingidae, such as *Daphnis placida* (Walker) (DAL pers. obs.), final instar larvae have been observed to forcibly remove tachinid eggs with their mouthparts. The observed parasitised *Langia tropicus* larvae reached pupation, but the fly larvae exited through the pupal walls and pupated in the surrounding soil. Further, several *L. tropicus* eggs were observed that appeared to have been parasitised by a small wasp species, as the eggs had died and darkened in colour and, being darker, were quite visible on the pale green leaf undersides.

Final instar larvae leave the food plant trees to pupate. They first turn a dull purplish colour, then wander off in search of a suitable pupation site. In captivity, such purplish larvae were placed in plastic containers with a sand base 150 mm deep. Some larvae began to burrow fairly quickly after being placed while others continued to roam over the surface for up to two hours. All eventually burrowed up to 100 mm deep in the sand, where they formed a cell lined with silk and sand particles in which they pupated. It is not known exactly where larvae pupate in the wild, but it is assumed that wild larvae would behave similarly to captive larvae and pupate below ground. The limestone outcrops around Chillagoe contain many suitable pupation sites, both with deep soil deposits or rock crevices filled with soil and leaf litter, but searches of such places have failed to produce any pupae. It is believed that *Langia tropicus* are able to diapause over the dry season as pupae, as several pupae in captivity have undergone a seasonal diapause of up to 14 months, with emergence following local hot, wet conditions after a long dry winter.

Acknowledgements

Garry Sankowsky of Tolga is sincerely thanked for his plant identifications and knowledge of the numerous coarse-leaved *Brachychiton* species of northern Australia. The company of Graham Wood in the field during the mid 1990s is also acknowledged.

Reference

MOULDS, M.S. 1983. A new species of *Langia* Moore (Lepidoptera: Sphingidae) from northern Australia. *Australian Entomological Magazine* 10: 75-79.